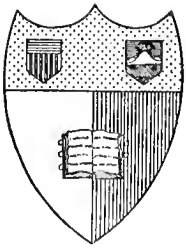
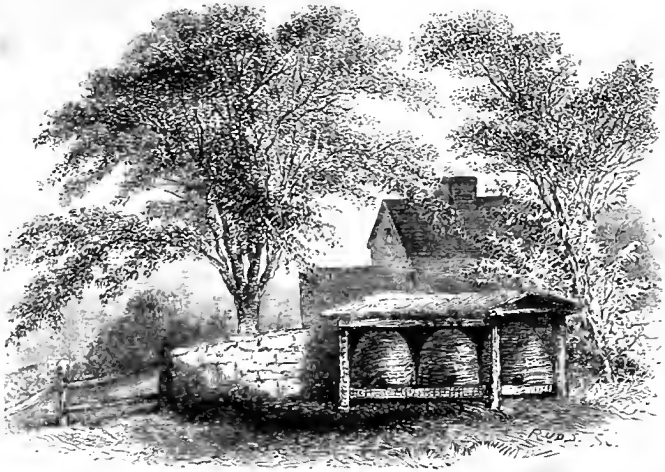


SUNDAY SCHOOL

OF

FIRST BAPTIST CHURCH,

Elizabeth, N. J.



THE

HONEY-MAKERS.

"My son, eat thou honey, because it is good, and the honey-comb which is sweet to thy taste; So shall the knowledge of wisdom be unto thy Soul."—PROV. xxiv. 13, 14.

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PREFACE.

In this little volume no attempt is made to give a full, scientific account of the "honey-makers," but only to present in a simple manner their most interesting characteristics. It is believed that the statements are in accordance with the most recent investigations, and that the reader will find all that is necessary to a satisfactory acquaintance with the life and habits of these wonderful insects. Every year adds to our knowledge of the bee, and its modes of labor, and increases our wonder and admiration for its peculiar instincts.

If the perusal of these pages shall lead the reader to give an additional thought to the "Lord that maketh all things," they will not have been written in vain.

DE B.

Chestnut Hill, Nov. 1862.

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THE HONEY-MAKERS.

CHAPTER I.

The Bee well known. — A Social Insect. — Bees and the Poets. — Origin of the Bee. — Different Kinds.

EVERY one is familiar with the honey-bee as it is seen on a bright summer morning gathering sweetness from the flowers, flying through the air, or buzzing about the little entrance to its populous home. When the sky is clear above us, and green pastures, thick-leaved trees, and fragrant meadows gladden the eye on every side, how musical is the hum of the industrious little worker as it darts about in the warm rays of the sun, and how busy and happy it appears as it drinks from the nectared cups of the many-hued blossoms that perfume the air. From the time when Israel sent "a little honey," and the "best fruits of the land" to Joseph in Egypt, the treas-

ures of the hive have been universally esteemed; and there is not a child who reads this book that

does not know the bee by sight and honey by taste.

Like all the works of the Creator, this little insect is deserving of our closer study, and our more intimate acquaintance. The shrinking fear of it we have felt, and perhaps the real aversion with which our childhood mind has been filled against it, will then change to admiration, and even affectionate regard. The life and habits of the bee, and its home with its thousand wonders, lead us to see the invisible God through his works; to recognize a great First Cause, "in whose hand is the soul of every living thing, and

the breath of all mankind." Such a study will present to us examples of industry, frugality, order, and skill, and we shall find ourselves at the feet of the "Great Teacher," the source of all knowledge. More than ever before shall we feel how true is the Bible when it says, — "Ask now the beasts, and they shall teach thee; and the fowls of the air, and they shall tell thee; or speak to the earth and it shall teach thee, and the fishes of the sea shall declare unto thee. Who knoweth not in all these that the hand of the Lord hath wrought this?"

By such a study we shall learn to estimate rightly the wonderful provisions and resources of a creative Providence, and to see our own relations to all the infinite varieties of nature. Thus too we shall see that in common with the insect that flies in the summer sunlight, our own dependence is upon that Being whose plan of creation embraces the humblest, as well as the highest. Each alike displays His wisdom, each has its destined and beneficent purpose to accomplish. One of the learned and godly writers of the olden time says, "If you speak of a stone, of

a fly, a gnat, or a bee, your conversation will be a sort of demonstration of His power whose hand formed them; for the wisdom of the workman is commonly perceived in that which is of little size."

The honey-bee is a social insect, the companion of man and the pioneer of civilization. Well known to the ancients, and still more extensively found among modern nations, it has always been an interesting study to all lovers of the useful and the beautiful in God's creation. It is related of an ancient philosopher that for nearly threescore years he made this little creature his sole study; and another passed his days in the forests, observing and recording the habits of this wonderful insect.

Poets, too, have given to the bee many of their most beautiful verses, and drawn from its habits many useful lessons. One of Virgil's pastoral poems is fragrant with what he aptly terms

"The heaven-sent gift of aerial honey,"

and the musical hum of the bee is continually heard over all his Italian fields. Every child knows the familiar words of Watts: —

"How doth the little busy bee
Improve each shining hour,
And gather honey all the day,
From every opening flower.

"How skillfully she builds her cell!
How neat she spreads the wax!
And labors hard to store it well
With the sweet food she makes."

Bryant, too, in smoothly-flowing lines, describes the bee as she

"Fills the savannas with her murmurings,
And hides her sweets, as in the golden age,
Within the hollow oak. I listen long
To her domestic hum, and think I hear
The sound of that advancing multitude
Which soon shall fill these deserts."

The quaint Herbert, who loved God and Nature so much, thus presents her as our teacher and example: —

"Bees work for man; and yet they never bruise
Their master's flower, but leave it, having done,
As fair as ever, and as fit for use;
So both the flower doth stay, and honey run."

From Asia, the land of its birth, the honey-bee spread over Europe, and probably found its way

to this country with the early settlers. "A more adventurous colonist than man," it is always a little in advance of him in his travels. In the early settlement of America, the Indians well knew when the "pale-face" was approaching, even before he had been seen, or the sound of the ax had been heard, admonished by the bees which came humming through the dense forests, depositing their honey in the hollow trunks of the trees, or in the crevices of the rocks. They are now found in a wild state in great numbers, and far from human habitations.

Bees are of three kinds; females, or queen-bees, — males, or drones, — and workers. These have nearly the same color, and possess the same general characteristics, but differ in size, form, and occupation. A well-peopled hive consists of one queen, who reigns supreme, several hundred drones, and many thousand workers. They live as a community of intelligent and social beings. Their adherence to law and order, and their regular modes of life, surpass even what is common among men, and show God's kind care over his creatures in endowing them with instincts which

accomplish for them all that man's reason does for him.

Man directs his labors and forms his habits of life according to his instruction and experience, and upon these depend his present and future good. The instinct of the bee, and of other animals, is independent of these, so that without deliberation they are unerringly directed to do whatever is necessary. Reason may fail, for man uses it; instinct is sure, for God directs it. Pope truly said, —

> "And reason raise o'er instinct as you can,
> In *this* 'tis God directs; in *that* 'tis man."

CHAPTER II.

The Queen Bee. — Attachment of her Subjects. — Gotthold's Emblem. — Birth and Infancy of the Queen. — Her Labors. — Laying of Eggs. — Young Bees. — But one Queen in a Hive. — Swarming. — Choice of a New Queen. — Battles between Rival Queens. — Manifestations of Divine Wisdom. — Nothing too Small to escape God's Care and Notice.

THE body of the queen-bee is longer and more tapering than that of the other bees, of a livelier

The Queen Bee.

shade of color, and tinged with yellow on the under side. Her wings are short, her movements slow and majestic, as becomes a queen, and wherever she goes she is accompanied by a little body-

guard of workers. This service is taken in turn, and never neglected, and she receives every mark of attention and respect which human beings can give to a beloved monarch.

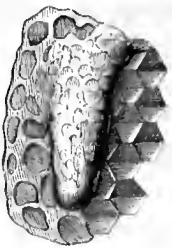
An old writer, who in all his daily walks saw proof that the God of nature was also the God of the Bible, and whose "Emblems" are full of devout thoughts, observed this singular affection of the bees for their sovereign. He says, "So strong is the attachment of the little honey birds to their king,* that they quit the hive with him, and follow and never leave him. When he flies, they do the same; when he alights, they fasten to him; if he remove, they hasten after him; and if by some accident his wings be injured, and he fall to the ground, they fall upon and cover him, as I have seen with my own eyes." He then says, "It is the same with the church of the saints; they have one only head, Jesus, and on him their whole heart is set, and their whole soul depends. Alas, Jesus! when shall my love to thee equal that of the bees to their king! My

* Gotthold wrote two centuries ago; singularly enough, he speaks of the monarch of the hive as "*king*."

heart bears witness that my love is still so weak as scarcely to deserve the name."

Although so loved and honored by her subjects, the queen performs not a single good deed for the well-being of the community during the two or three years of her reign, except to increase its numbers. Like many human sovereigns, she is seldom roused from her luxurious indolence, save when her queenly spirit is chafed by jealousy. Like queens of the earth, she is born on an equality with all her sisterhood; and like them, she comes into the world a helpless infant.

But a royal bed-chamber, large and circular,



Royal Cell.

has been built for her. Here she has ample room for growth, and as she rests in her dainty crib, is fed with the most delicious food. The

common "bee-bread," considered good enough for the rest of the household, is too coarse for the infant queen. A delicate dish is prepared from flowery juices, and carefully reserved as royal food. This is regularly served by the attentive nurses who continually watch and wait upon the little princess.

Thus elegantly lodged and richly fed, the favored grub grows to her full size. She then spins a silken robe, which, when expanded, fills her chamber, and renders it soft and smooth. About the sixteenth day she comes forth, slowly and with a queenly step, differing in form, powers, and instincts from the other inmates of the hive. Encircled by golden rings, her short and filmy wings making a scanty gauze drapery through which her brilliant colors shine in beauty; she looks like a queen in her royal robes. She immediately takes her place as reigning monarch, and all unite in honoring her.

The queen's chief employment seems to be the laying of long, slightly-curved eggs, of a bluish tinge. Before depositing an egg, she examines whether the cell is properly prepared for

the future grub, since the different sexes have each their peculiarly constructed chambers. The eggs producing workers are deposited in six-sided horizontal cells; the cells of the drones are somewhat irregular in form, while those of the queen-bees are spacious, circular, and vertical.

The queen-mother, with unvarying accuracy, deposits each egg in its proper cell, generally laying about two hundred in a day, commencing with those which produce workers. This occupies her for ten or twelve days, during which time the larger cells are in process of construction. In them, for the next sixteen or twenty days, she lays male eggs, but fewer in number than the former. Whether royal eggs shall be laid or not seems to be left to the discretion or judgment of the inhabitants of the hive, and is another instance of the wonderful instinct with which God has endowed them. If there is to be no vacancy on the throne, the bees make no preparation for another monarch. They expend no useless labor; they do no work without some definite, practical end in view.

If the population of the hive is so great that it

is apparent to the bees that they must soon colonize, or "swarm," the royal cells are commenced. In each of these, at one or two days' interval, the queen deposits a single egg, the rest of her time being spent in laying workers' eggs.

When laid, the eggs are covered with a glutinous coat, which causes them to remain a few days unchanged in shape and position in the bottom of the cell. A small white worm is first hatched, which, when grown so large as to touch the opposite side of the cell, coils itself up like a dog or cat going to sleep. Feeding upon the rich food provided by the attentive nurses, it gradually grows until its two ends touch each other and form a perfect ring. Can mothers provide for their children better than the bees for their infant brood?

Caterpillar of the Bee, with its cocoon of silk, which, when expanded, fills the entire cell, and renders it smooth and soft.

Only one bee can reign in a hive at a time, and so jealous is she of her rights, and so envi-

ous of rivals, that great pains is taken to keep her on her throne unmolested. Having made their preparations in anticipation of a swarming, the young of the royal family are carefully guarded from her attacks; but if for any reason the event does not take place, the old queen is permitted to approach the royal cells, when she destroys the brood one by one, by stinging them as they innocently sleep in their tiny chambers.

The swarming season, which begins in the spring, is a period of no less interest to the bees than the departure of a company of emigrants, or the settlement of a new country, to human beings. Perhaps the reader has seen a family start for "the West," and has noticed how much preparation is necessary, and how much interest each one takes in the proposed journey. The travelers look at the sky and the clouds; they choose the finest weather; they provide for every want so far as is possible. So the bees prepare for the expected event with equal care and foresight. The time is chosen at the beginning of a long, bright summer, for the bees never travel in winter. The queen bee has seen that the hive is

well stocked with eggs of all kinds, so that the prosperity of those remaining in the "old country" may be insured. She herself has now a more slender shape, and is lighter and better fitted for her journey. Her dislike and envy of the royal brood slumbering safely in their waxen cells, and defended by the bees from her rage, agitate her, and she becomes impatient of delay. She is anxious to reach her new home, where she can reign without fear of rivalry.

At last the buzz of preparation is heard in the hive. The workers are restless, and hurry to and fro; they collect large quantities of extra provisions, filling their honey-bags with materials for commencing work in their new habitation, or for food, in case several stormy days should follow their emigration. Scouts are sent out in advance, to look for a suitable place for the infant colony, and every thing made ready for the journey.

What a perfect picture is this of similar scenes in human life! And how wonderful that these insects should know from instinct what man can only gain from long and varied experience! The

more we study the habits of this little insect, the more are we astonished to find so much that is like our own daily experience, — so much that speaks of an intelligence wisely directing all its actions. As long ago as when Augustus Cæsar reigned over the Roman Empire, his ardent poet-admirer wrote, —

"Of all the race of animals, alone
The bees have common cities of their own,
And common sons; beneath one law they live,
And with one common stock their traffic drive.
Each has a certain home, a several stall;
All is the state's; the state provides for all.
Mindful of common cold, they share the pain,
And hoard for winter's use the summer's gain."

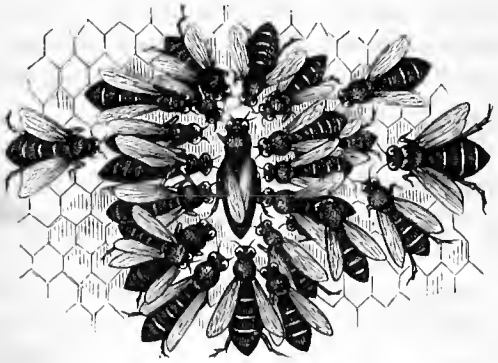
At last the colonists depart, led, or sometimes followed by their queen, and the hive is left in comparative quiet. Let us enter and see what the bees remaining there will do, now that their queen has gone, and with her so large a portion of the population.

Rows of six-sided houses hang suspended from the roof of the hive, some occupied as store-rooms for honey and bee-bread, others as nurseries for infant bees, and some even as bedrooms

for bee-laborers, who there recruit for fresh exertions. The little community is in commotion; their queen has gone, and what is to prevent anarchy in place of the well-ordered government under which they have been living? God has provided for this, and the new queen is chosen with less hesitation and even more certainty than among the nations of men.

Among the common six-sided dwellings and store-houses are a few circular royal structures, such as have been already described. These are occupied by young scions of royalty, who, in common with all the young of the community, were on the sixth day from their birth each shut in her cell by an arching roof thrown over it, and as yet have not been released from their prison. Within these waxen palaces have been nurtured for some weeks, in different stages of growth, the young princesses, for one of whom the vacant throne is destined. The first-born is the one always chosen. The anxious bees, with faces turned toward the royal apartments, where, wrapped in their silken robes, the nymphs abide their time, wait the appearance of their sovereign.

At length, the royal lady, in the full maturity of her proportions and beauty, issues from one of the chambers. A joyful hum of applause proclaims her queen, and all do her honor.



The Queen receiving the homage of her subjects

It sometimes happens that two of the royal family emerge from their respective chambers at nearly the same moment. Like human rivals for the same throne, the two bees quickly see that one of them must yield; there can be no divided authority. The crowd fall back, and the rivals rush at each other. If either attempts to retreat, a few bees darting upon them from the crowd

prevent escape, and even restrain them from fighting, until, chafed into fury, they burst from their subjects' hold, and rush into the deadly strife. The hum of the spectators increases to an uproar, the duel continues, and at length one falls, mortally wounded. The survivor's supremacy is now fully established, and, with the consent of all her subjects, she tears open the chambers of the remaining princesses, and slays them one by one. The bees aid her in this cruel work, by dragging away the dead bodies, and removing all traces of her jealous fury.

How does the life of the bee teach us that God gives us "help in time of need;" that he always places at our disposal the means by which to meet every want of life; and that, inasmuch as we are "of more value than many sparrows," he will certainly care for us in all our necessities!

Sometimes a hive is unexpectedly bereft of its monarch when no young queen is living to supply her place. At such a time is exhibited the most convincing proof that bees have a language of their own, and that they communicate intelligibly with each other. When a queen has been taken away,

the business of the hive goes on well for about an hour; then a few workers appear agitated, cease from work, forsake the young, and wander about in great alarm. As one bee meets another, they mutually cross their *antennæ*, or feelers, and the one which seems first to have learned the sad news tells the mournful story to the other, by gently tapping it with these slender, flexible organs. The latter, in turn, becomes agitated, runs over the cells spreading the tidings in the same manner. Thus, at length, the whole hive is in confusion, and so continues for several hours, when all becomes calm, and they set to work to repair the loss.

They accomplish this in a most surprising manner. Hastily pulling down the waxen walls of several of their six-sided houses, they slay all the infant bees, or grubs, within them but one. For this a brilliant life is in prospect. But for the vacated throne, this bee of humble birth, straitly housed, and poorly fed, would have left her cell a common worker. But now, room being made by tearing down the adjacent cells, her narrow house is changed to a royal dwelling,

and the bee-nurses feed her with the stimulating "royal jelly." In about ten days, she issues forth as perfect a queen as ever came from a royal egg.

In the whole range of animal life there is perhaps nothing more wonderful than these provisions of the Creator for the necessities of the little commonwealth of the hive. We may call it Nature, but

> "Nature is but a name for an effect
> Whose cause is God."

It is not alone intelligent design which is manifested, but *benevolence*, stooping from the hight of heaven to plan and to care for an insect. When infidels are urged to receive the Scriptures, they often say that God is too great to attend to creatures so insignificant as ourselves. But what an answer to such an objection is found in the little incidents of bee-life just narrated! It is plain that God cares for the bee; shall he not, then, care for us?

Man, created holy, coming forth in innocence from the hand of God, was fully provided for. Man fell; but was he left to perish? No; a

Saviour was offered, able and willing to save to the uttermost: "Christ hath redeemed us from the curse of the law." "In this was manifested the love of God toward us, because that God sent his only begotten Son into the world that we might live through him."

CHAPTER III.

The Drone. — Its Life and Habits. — Its Reputation for Idleness. — The Charge refuted. — Incentives to Useful Living.

THE *male bee*, or *drone*, so called, as some think, from the peculiar noise he makes when

The Drone.

on the wing, is much larger than the worker, and thicker in proportion. The whole design of his existence seems to be the propagation of the species, and consequently he has no organs for labor of any kind, and performs no work.

From this fact, the drone has been called an

idler, — a useless member of the bee-family ; and so far has this injustice been done to the little insect, that we apply the word "drone" to all idlers who live lives of luxurious ease at the expense of others. Thus an English physician, in a beautiful poem on bees, says of the drones, —

> "Their short proboscis sips
> No luscious nectar from the wild thyme's lips,
> From the lime's leaf no amber drops they steal,
> Nor bear their grooveless thighs the foodful meal;
> On others' toils in pampered leisure thrive
> The lazy fathers of the industrious hive."

The drone does not work, simply because he *can not* work. He has no tongue suitable for gathering honey, no baskets for carrying food, and no implements for wax-making. Shall he be censured for not using those things which he does not possess, for not performing labors he was never intended to perform? He faithfully fulfills the objects of his creation, and interferes not with the labors of others. Should we all accomplish as faithfully the work God has given us to do, our lives would be one continual testimony to his glory.

There is nothing superfluous in creation. All animals, man himself included, are fitted for the work which God intended them to perform, and no more. Thus, in the hive, the queen is especially adapted for her office, the worker has at command all the tools for the multiform labors expected of her, and the drone is no less perfectly fitted for his peculiar sphere. The beauty and perfection of system in the hive, which we so much admire, are thus preserved, and one harmonious whole tells of the wisdom so manifest in all the works of the Creator. Three or four hundred, and sometimes, although rarely, as many as two thousand drones, live in one hive, but in the early autumn they fall by a general massacre. Their purpose in life is accomplished, and by means of a wholesale slaughter the community is free from their useless mouths before the wintry frosts and snows seal up the flowery fields and imprison the little insects in their homes.

Although we see the injustice of calling the drone an idler, yet we may profit from the lessons which have been drawn from his supposed useless life. How many human "drones" do we

meet with, useless idlers in the world, adding nothing to the welfare of society, and a burden to those who are compelled to endure their presence. But idleness never leads to prosperity. "The idle soul shall suffer hunger," said he who knew the value of labor and the luxury of ease. "He becometh poor that dealeth with a slack hand; but the hand of the diligent maketh rich."

Idleness deserves no long record. Those who spend their lives, be they long or short, in good deeds, — those who are a blessing to the world, and whose loss is deeply felt when God takes them home to that rest that remaineth for his people, — are the men who make long and bright chapters in the world's history. The Earl of Stirling once said, "Men should strive to live well, not to live long;" and doubtless the reader recalls the oft-quoted lines of Young, —

> "That life is long which answers life's great end;
> The time that bears no fruit deserves no name;
> The man of wisdom is the man of years."

Lives of usefulness are always honored. We love to read of those who have been benefactors to the human race, and whose names shine brill-

iantly along the pathway of ages. Their example should stimulate us to diligenee in our own work.

"We live in deeds, not years — in thoughts, not breaths —
In feelings, not in figures on a dial;
We should count time by heart-throbs. He most lives
Who thinks most, feels the noblest, acts the best."

God's blessing will crown the labors of his children, and without this all work is in vain. Let it be our aim to be useful in the world, that we may die with the assuranee of having done something for the good of man and the glory of our Heavenly Father, and of having left behind us an example of holy living and holy dying.

Longfellow says, —

"Lives of great men all remind us
We can make our lives sublime:
And, departing, leave behind us
Footprints on the sands of time."

But our noblest example is in the life of Him who "went about doing good." If even *he* said he must be about his Father's business, how much more should we continually bear in mind that our "chief end is to glorify God and enjoy him for ever."

CHAPTER IV.

The Worker. — Traits of Character. — Its Body — Bread-baskets. — Honey-bottle. — Tongue. — Sting. — Collecting Food. — Nurse Bees. — Wax Workers. — Their Labors. — Virgil's Description.

WORKERS constitute the principal population of the hive, there being often as many as twenty

The Worker.

thousand, or even more, in a single community. From the worker, the bee character has always been painted, — loyal, laborious, patient, and skillful. These traits are to some extent to be attributed to its treatment during infancy, just as in a human being the early habits and training affect the whole after-life.

Upon emerging from the egg, the infant worker finds herself living in a snug little room with six sides, and so constructed as in some measure to limit her growth. Her food is the simple fare of "bee-bread," amply sufficient in quantity and quality to bring to maturity every useful form of activity, but destitute of any element tending to the development of sensual or vindictive passions. These being consequently smothered in the cradle, the worker at last comes forth, "modest in habits, a nun among insects, and a very 'sister of charity' among her fellows."

The body of the worker is about half an inch in length, one sixth of an inch in its greatest breadth, and oblong in shape. The middle portions of the hind legs are hollowed into triangular cavities, or baskets. In these are carried the pollen, propolis, and other hive materials; and they are surrounded by an elastic fringe of hairs, which, rising above the edges of the baskets, prevent the high-heaped food from being lost. The bottom of this basket is composed of a smooth, shining, horn-like substance, hollowed out in the leg. In this curiously formed

basket the bee carries its load safely to the hive.

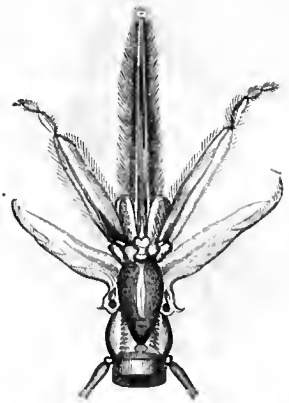
Hind Leg of the Bee, highly magnified.

At the end of the feet are little hooks, by which they adhere to the walls of the hive, and often to each other.

Beside the stomach proper, the bee has what may be called a honey-bottle, consisting of a little membraneous bag, pointed in front, and used simply for the retention and safe transportation of honey.

For taking up the sweet liquids of the flowers, and turning them into this little bottle, she is provided with a long, flexible proboscis, which acts in all respects like a tongue, but is in fact a prolongation of the under lip.

It is not hollow, as was once supposed, but solid, and covered on all sides with a fringe-work

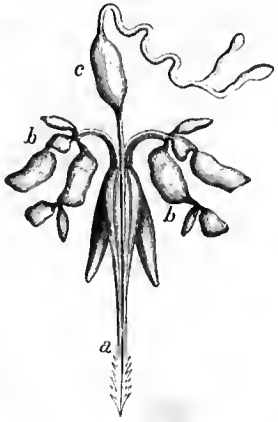


Proboscis of the Bee, highly magnified.

of hairs. To this the honey adheres, and is conveyed through the mouth to the honey-bottle within.

Queen-bees and workers are armed with stings; the males have none. The sting consists of two long darts, with a protecting sheath. A little sack (*c*, page 40), to contain the poisonous fluid, is connected with it, and powerful muscles (*bb*)

for its propulsion. The wound appears to be first made by the sheath, along which the poison passes in a little groove; and the darts, thrust out afterward in quick succession, deepen the wound. These darts are furnished with a number of barbs,



Sting of the Bee, highly magnified.

which render it so difficult to withdraw them quickly that bees often lose their lives by the injury they sustain in the effort. The sting of the queen bee is stronger, and consequently is not often lost in this way.

The most delicate workmanship of man, when examined by the microscope, appears rough and uncouth; the finest and most highly polished needle seems but a rough bar of steel with a blunt point; but the sting of a bee thus examined is found to be a beautifully polished shaft, gradually tapering to a point so small as to be scarcely visible, almost too minute for even the magnifying-glass to catch its proportions. Such always is the difference between the works of God and of man. In one, the closer the scrutiny the more manifest are the imperfections; in the other, we find continual cause for ever-increasing wonder and admiration.

The sting of the bee is seldom or never used except in self-defense. Contrary to the common impression, bees are among the most harmless of insects; and their gentleness, when properly managed or treated, renders them remarkably subject to human control. Those most conversant with bees and their habits say that they issue from their hives in the most peaceable mood imaginable, and unless abused allow themselves to be treated with the greatest familiarity.

The body of the worker, like that of the other bees, is clothed with a hairy down; and the bee, rolling in the food-giving flowers, soon covers herself with the dust. The hind-legs, with their baskets, have already been described. The other legs are furnished with delicate hair-brushes, with which the bee carefully wipes off the collected dust, and, after working it over, deposits it in her baskets. When gathering propolis, (which will be spoken of at length as we advance,) the bee kneads it until it becomes somewhat dry and less sticky, and this process sometimes occupies half an hour. She then passes it backward by means of her feet to the cavity of her basket, giving it two or three pats to make it adhere; and when she adds a second portion, she often finds it necessary to pat it still harder, crowding it down with all the energy, skill, and desire to carry a large load that a human being could manifest under similar circumstances. When she has gathered as much as the basket will hold, and the delicate, elastic fringe-work bends with the heaped-up burden, she flies off to the hive, and unloads her treasures for the common good.

Workers are divided into two classes, — nurse-bees and wax-workers, — whose duties are in general shown by their names. The nurse-bees are rather smaller than the wax-workers, and even when filled with honey do not appear distended like them. They collect honey and distribute it among their companions; they feed and take care of the infants; they complete the combs and cells commenced by the others, but they do not provision the hive.

The wax-workers are not only a little larger than the nurse-bees, but, unlike them, their stomach, when filled with honey, is capable of considerable distension. Neither kind alone can perform all the work of the hive. Each has its peculiar work to do, and does not attempt things naturally belonging to others. Can we not derive a lesson from this? Shall we not learn not to dissipate or waste our labors on various matters instead of doing our own appropriate work, and doing it well. The Lord places each of us in positions where we have specific duties to perform. Let us carefully perform these duties, mindful of the precept, "Whatsoever thy hand findeth to do, do with thy might."

When hives are full of combs, the wax-workers empty their honey into the ordinary storehouses, and make no wax, for the simple reason that no wax is then wanted. But if a reservoir is needed for its safe keeping, or if there are no cells in which the queen can lay her eggs, the wax-workers retain the honey in their stomachs, and in twenty-four hours they produce wax, and then they commence the work of building combs.

It might perhaps be supposed that, when the country did not afford honey, or when fields were destitute of flowers, the wax-workers consume the provision stored up in the hive. But this is not allowed. A portion of honey is carefully preserved, and the cells containing it are covered with a tightly-fitting waxen lid. This is removed only in cases of extreme necessity, or when it is not possible to procure honey from other sources. Never during the summer are these jars of honey opened; they are saved for times of greater need. But there are other vessels always open which furnish daily food for the household. These open jars are common to all, but the bees take only what is necessary for their present wants.

In studying the habits of the bee, we shall find our chief points of interest in the life and labors of the workers. Their skill, ingenuity, and industry surprise and delight us. All have their peculiar offices to fill, and no jar arises from conflicting interests.

Virgil well describes the varied employments of the workers: —

"Some o'er the public magazines preside,
And some are sent new forage to provide:
These drudge in fields abroad, and those at home
Lay deep foundations for the labored comb,
With dew, narcissus leaves, and clammy gum.
To pitch the waxen flooring, some contrive;
Some nurse the future nation of the hive;
Sweet honey some condense; some purge the grout;
The rest, in cells apart, the liquid nectar shut.
All with united force combine to drive
The lazy drones from the laborious hive.
With envy stung, they view each other's deeds;
With diligence the fragrant work proceeds."

CHAPTER V.

Dwellings of Bees. — Skill of Bees in furnishing them. — Shape of Cells. — Secretion of Wax. — Gathering of Honey. — Propolis. — Neatness and Health of the Hive.

THE hive is not the original home of the bee. In their wild state the bees constructed their

The Cells.

beautiful net-work of cells in the decaying trunks of trees, in crevices of the rocks, and in the ground. Thus, in one of the Psalms, God says, "With *honey out of the rock* should I have satisfied thee;" and Moses, "He made him to suck honey out of the rock."

Virgil, in one of his poems, writes: —

"Nor bees are lodged in hives alone, but found
In chambers of their own, beneath the ground:
Their vaulted roofs are hung in pumices,
And in the rotten trunks of hollow trees."

But closer observation of the habits and wants of the honey-bee has enabled man to provide artificial homes for the little insect; and the bee-hive is as familiar an object as the bee itself.

Wherever the bee has chosen its home, whether the cleft of a rock, or in a hive, it is not fit for habitation until a great deal of ingenuity and labor have been expended upon it. A family would as soon think of living in a house without furniture or food, as the bee of inhabiting the hive or the rock until it was fitted up and furnished in the elegant style of bee-architecture. The hive, or the cleft in the rock, are but the mere walls of the dwelling, rough and unfurnished. The same divine goodness which has endowed us with faculties for adorning our own homes, and adapting them to our necessities and comfort, enables the bee to make for itself a home of surpassing skill and beauty.

The bees must have shelter for themselves,

storehouses for honey, bee-bread, and eggs, nurseries and bedchambers for their young, and royal apartments for their queen. In the construction and arrangement of these, they display a skill which astonishes us. They solve by unerring instinct the most difficult mathematical problems. Were we told to make from a certain quantity of wax a group of cells exactly alike in size and shape, and disposed in such a manner as to occupy the least possible space, with no waste of material, we should not find the problem an easy one. All our experience, skill, and mathematical knowledge would be necessary, and if, in addition, we were told that all the angles of our cells must be angles of the greatest strength, we should very likely fail in our attempts. But the bees readily accomplish this task; they construct their comb upon the soundest principles of geometry, with no mistakes and no failures. Truly, "the Lord giveth wisdom, and out of his mouth cometh knowledge and understanding."

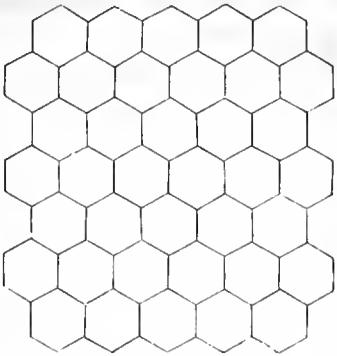
It is impossible to look at a piece of comb taken from a hive, without wondering not only at its beauty, but its perfect regularity. It might

seem at first thought that the circular or cylindrical form would be best adapted to the shape of the insect. But were this the case, one of the most important conditions of the difficult problem given a few sentences back would be omitted. Place any three tubular dishes or vessels so that their sides shall come in contact; or even three apples or three tumblers will show the same result. There will be a vacant space, waste room, between them; they cannot be so brought together as to occupy all the space. So in the honey-comb, there would be an open and waste space between every three adjoining cells, while strength would also be lost by the lack of support upon the sides.

Were the cells triangular, or square, the comb could be made, without needless vacancies; but either of these forms would require more material, and be unsuitable to the shape of a bee's body, while they would be deficient in strength.

The six-sided form of the cell obviates every objection; and, while it exactly fulfills the conditions of the problem, is as well adapted to the shape of the bee as a cylindrical form.

The form of the cells, and the manner in which the sides fit each other, are exhibited in the following cut.



Shape of the Cells.

The more we consider the shape of the cells, the more are we lost in wonder. Some have endeavored to account for it by supposing that the construction is determined by the form of the delicate instruments with which the bee performs her labors, thus giving to the insect no merit of ingenious contrivance. But even if this were so, would it not show equally well the kind care of the Creator in giving to her tools of such shape

that she must, even ignorantly, construct for herself a house of the most convenient form and dimensions? It has been suggested, too, that bees, like some other insects, use their bodies as standards of measurement.

But it has been ascertained that the bees are not provided with instruments corresponding to the angles of the cells. There is no more resemblance between them than between the shape of a carpenter's saw and the board, or the chisel of the sculptor and the marble statue. More wonderful than if this were so, the shape and construction of the cell and the comb are in the mind of the bee, speaking of the insect as an intelligent being; and thus are shown most beautifully the operations of that instinct of animals which so often surpasses man's reason.

Before describing the manner of building the comb, it will be well to look at the material of which it is made.

Wax is the principal substance used, one of the most important and interesting of insect productions. It is employed by man for a great variety of uses. It shines in church tapers, by

whose flickering light, instead of the "Light of life," the papal priests conduct their services; it looks upon us from the faces of images; the children see it in their gaily-dressed dolls; it blooms in fadeless beauty in flowers that rival nature in brilliancy; it seals our messages of love, of joy, and of sorrow. One of Shakspeare's heroines says, on opening her husband's letter,

> "Good wax, thy leave, — Blessed be
> You Bees that made these locks of counsel;"

and the quaint Fuller speaks of wax as "good by day and night, useful in law instruments to seal, and in physic."

Bees do not find wax, like honey, already made for them, but it is produced from the gathered pollen and honey by a chemical process in the bodies of the insects themselves. Honey is secreted by the flowers, and stored in the little cups at their base; pollen is the fine dust or flower which covers the tops of the stamens of blossoms, and in which the bee rolls itself and gathers its burden. The quantity of wax secreted depends upon the consumption of honey.

The stomach of the worker is a little manufactory, where the raw material is wrought over into wax ready for the building. It was once supposed that the wax was found ready made, as well as the honey. This mistake is not to be wondered at. Honey itself was believed by the ancients to be a dew which had fallen upon the flowers from the air, or an "aerial dew," as they poetically called it; but why it should fall only on the blossoms, they did not inform us. In this they made two mistakes, — for the dew does not fall, nor is honey made in any such manner.

Experiments show that honey is the principal ingredient in wax. One of the keenest observers of bee-life noticed that the little pellets of pollen seen on the thighs of bees are of different colors, according to the hues of the flowers from which they were collected. Now it is well known that the color of the new-made comb is always uniform, and so this gentleman justly concluded that pollen was not the base of the wax. He also ascertained that pollen is collected with greater eagerness for old hives, where the comb is complete, than where the comb is in process

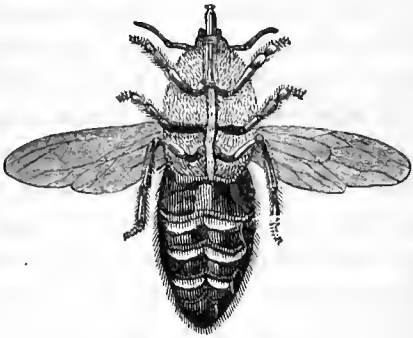
of construction, thus showing conclusively that pollen can enter but slightly into the manufacture of the wax.

The first stomach of the working-bee, as already stated, is appropriated to the reception of honey. It is never found in the second stomach, which may be aptly compared to a well-hooped cask, as, from one end to the other, it is surrounded by muscular rings. Within these rings the wax is elaborated. The wax-pockets themselves, which are concealed by the overlapping of the rings, may be seen by pressing the abdomen of the worker so as to lengthen it, thus separating the rings further from each other.

Sometimes the scales of wax are so large as to project beyond the rings, and may be seen without separating them as first mentioned. As tears in the eye of man, or saliva in the mouth, so the wax appears to be secreted in the little pouches.

The formation of wax is the peculiar office of the wax-workers, who may be easily distinguished from the nurses by the greater size and more cylindrical shape of the abdomen, and their

larger stomach. The nurse-bees are indeed furnished with wax-pockets, but they secrete wax only in trifling quantities, while in the queen bee and the drones no pouches are to be found.



Worker Bee magnified — showing position of the scales of wax.

There is, however, another article used by the bees in their architecture: this substance, being chiefly used in the projecting portions and outworks of their waxen structures, is called *propolis*, derived from two Greek words signifying "before the city." It consists of a brown resin, collected from various trees which produce a similar gum. The bee carries it home in her little baskets, having first worked it over with

her fore feet to render it less adhesive. The sticky quality of the gum gives to the wax that tenacity which is necessary in the many ways and positions in which it is used, — such as attaching the comb firmly to the top and sides of the hive. With this gum also the white honeycombs are varnished, and the edges strengthened; with this all accidental holes are stopped, and it is made to contribute to the scrupulous neatness for which bees are so remarkable. The sanitary economy of a hive is worthy of imitation. Every noxious substance not too large for the bees to manage is instantly carried from the hive; and whatever is too bulky or too heavy for them to remove is completely embalmed with propolis and thus all unwholesome odors prevented.

A writer on the subject says, that "it sometimes happens that an ill-fated snail creeps into the hive. This is no sooner perceived, than it is attacked and stung to death. But how are the bees to carry out so heavy a burden? Such a labor would be in vain. To prevent the noxious smell that would arise from its putrefaction,

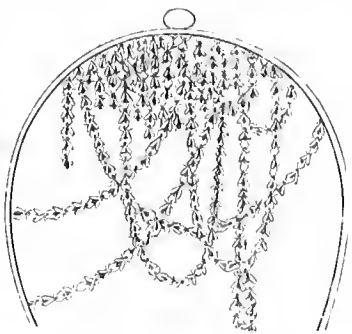
they immediately embalm it, by covering every part of its body with propolis, through which no effluvia can escape. When a snail with a shell gets entrance, to dispose of it gives much less trouble and expense to the bees. As soon as it receives the first wound from a sting, it naturally retires within its shell. In this case, the bees, instead of pasting it all over with propolis, content themselves with gluing down the margin of the shell, which is sufficient to render the animal immovably fixed."

Having now seen of what material the comb is made, we are ready to examine the manner of building; and we shall find the bee as ingenious an architect as man.

CHAPTER VI.

Construction of the Comb. — Division of Labor. — Arrangement of the Cells. — Different kinds of Cells. — Ingenuity of Bees. — Arrangement of the Comb. — Remarkable Instance of alteration of a Comb. — The Wonders of Creation.

As a preparatory step in the construction of a comb, the wax-workers suspend themselves from



Festoons of Bees secreting Wax.

the roof of the hive in necklace-like festoons, and remain motionless for hours, to all appearance at

rest, but in fact secreting the wax which becomes visible on the rings of their bodies. In the above figure may be seen this curious spectacle.

At length a single bee leaves one of the central festoons of the cluster, clears herself a space, goes to work alone, gathers the wax from her body, kneads and deposits the little particle, thus laying the foundation of the waxen city; then retiring, a second bee imitates her example; then another and another, until a block of wax is formed at the top of the hive. This pro-

Worker Bee laying the foundation of a comb in the top of a glass hive.

cess is exceedingly interesting, and shows the perfect adaptation of the organism of the bee to its labors. Provided with pincers at the joint of the third pair of legs, it seizes with them a scale of wax, brings it forward to its mouth, by which it is broken and kneaded, and, by means of a frothy liquid from the tongue, comes out in the form of a narrow ribbon. Sometimes the

tongue appears during the process like a trowel, and at other times like a pencil. Again the wax is pushed into the jaws, to be a second time worked over; and at last, the little particle thus made ready is fastened to the roof of the hive, the bee adjusting it with the point of her jaws. In this manner the successive scales are placed.

As the work proceeds, we discover another wonderful example of the division of labor among the little artificers. The material may, at this stage, be compared to the rough-hewn foundations of a building. A second band of workers now appear, who examine and adjust the angles, remove superfluous wax, and complete the work. Attendant upon these is a third party, which, with propriety, might be called the "provision train." These are always in waiting, as the workers who are finishing the cells never stop until the whole is completed, and so, whenever they are hungry, their luncheon is ready. The worker, when hungry, bends down her head upon the waiter, as if telling her wants. The waiter then opens her bottle of honey and pours out a

few drops; these can be seen distinctly as they roll along the tube-like proboscis, swelling its size as they pass.

The first cell determines the position of all that succeed it; and, in ordinary circumstances, two are not commenced in different parts of the hive at the same time. When a few rows have been constructed in the central comb, two other foundation walls are begun, one on each side, parallel with it, and at the distance of a third of an inch. Thus street by street is added to the little city, forming highways of travel for the bees. The combs are also pierced with holes to allow of inter-communication, and thus prevent loss of time in going round by the regular streets.

The cells, the open ends of which are shown on page 50, are joined at their bases to the bases of similar cells opening from the opposite side. These sets of double cells constitute the "comb," familiarly so called, and vary from one to two inches in thickness, thus making each cell from half an inch to an inch in depth. The bottom of a cell has the shape of a flattened

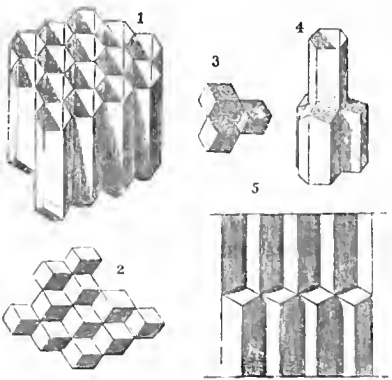
pyramid with three rhombic sides, that is, the floor is sloping, being formed by three inclined planes.

The equal distances between the combs, or the streets, as we called them a few sentences back, are of more importance than at first appears. Were the combs too far apart, the bees would be so scattered that there would be difficulty in maintaining the heat necessary for hatching the eggs and rearing the young. And if they were nearer together, the bees could not easily travel about and attend to the duties of the hive.

The wonderful foresight of the bee is said to be especially manifest at the approach of a winter of unusual length, when, of course, they need to lay by a larger store of food than usual. At such times they lengthen the cells which contain the honey, and so are able to provide liberally for the coming winter. The space between the combs is by this operation proportionally lessened. Sometimes, also, when their busy season is over, and less room is required, the streets are made narrower. On the return of spring,

the bees hasten to reduce the length of the cells, in order that they may be fit for receiving the eggs which the queen is about to deposit, and thus the original width of the streets of the little city is restored.

The construction of the bases, and the manner in which they fit into each other, are shown in the following figures.



1. Cluster of cells from one side of the comb. 2. Plan of the bottom of the cells. 3. Plan of the tops of three cells of one range, to show that by a combination of one plane from each, the bottom of a single opposite cell is formed. 4. Four cells, three on one side, and one on the opposite side, showing the manner in which they join. 5. Sectional plan of two tiers of cells.

One practical advantage in the cellular structure of the hive is, that the honey contained in these little jars, each carefully closed from the air by a lid of wax, is preserved from fermentation. If it were stored in one mass in a single receptacle, it might, in warm weather, become sour and unfit for use.

Cells are of different sizes; the royal cells being the largest, those of the drones next, the workers' the smallest. Such as are used for storehouses are of various diameters. The cells of drones have a convex lid, while in those of the workers it is nearly flat. Huber once placed some grubs of workers in the cells of drones; the misplacement was quickly detected, for the bees soon gave them a flat covering. The cells of the workers are made first, then those of the drones, usually near the bottom of the comb, and, lastly, the royal cells. Of the latter there are usually three or four, although sometimes as many as ten or twelve. These are attached to the central part, though occasionally they are placed on the edge of the comb; they taper gradually downward, and the exterior is pierced with

holes. The mouth remains open until the grub is ready for its change. At this time the bees close each of the cells with a waxen lid, leaving within sufficient room for the movements of the imprisoned insect.

In this connection a striking instance may be related showing the marvelous instinct of the bee.

A swarm was placed, on one occasion, in a very flat glass hive, and the bees formed one of the combs parallel to one of the sides, where it was so straight that the cells could not have their usual depth. The queen, however, laid eggs in them, the workers daily fed their inmates, and the cells were closed at the usual time. A few days afterward, holes were observed in the lids, out of which the bodies of the little dwellers protruded, the cells being too short for their motions.

The question then arose as to what would be done? Would the grubs be destroyed or abandoned? No. Instinct proved a sufficient guide for the emergency. The bees saw the difficulty, but allowed the grubs to remain, and gave to the cells new roofs much more convex than

usual. Thus the cells were rendered deeper, and the evil remedied. Could man's reason have dictated a wiser course?

The comb is fastened to the hive by its edges, or the outer double row of cells. The cells of this first row have only five sides instead of six, the roof forming one. This arrangement is sufficient for some time; but at length, as the store of honey increases to the weight of several pounds, the architecture is too frail; to sustain it, stronger material is needed and more solid supports. The bees do not hesitate. No human artisans understand better how to remove or repair old buildings than these sagacious insects. They gnaw away the sides of these cells, and build thick, massy walls and heavy pillars between the comb and the top of the hive. They do not however disturb the *bottom* of these cells, nor remove both sides at once. Working first upon one side and then upon another, they replace the demolished portions, as they proceed, with their strong cement.

It appears that bees can even alter the form of their cells when required by circumstances,

and that in a manner truly remarkable. As the bees were making a comb, Huber placed in front of it a slip of glass, and immediately they seemed aware of the difficulty of fastening it to so slippery a surface. Instead, however, of continuing the comb in a straight line, they so bent it as to extend beyond the slip of glass, and fixed it at length to a part of the wood-work of the hive not covered by the glass. They made, too, the cells on the convex side of the bent part of the comb much larger, and those on the concave side much smaller than usual. Nor was this all; for as the bottoms of the small and large cells were as usual common to both, the small ones were considerably wider at the bottom than at the top, and it was the reverse in the large ones.

Such achievements as these can not but excite alike our admiration and wonder. Truly has it been said that insects "have been found capable of exciting enthusiastic energy, incomparable patience, and fervent piety." So earnest did a celebrated Dutch naturalist become in his studies on the habits and structure of the bee

that he exclaimed, "Oh, for one year of continued light and heat, that I might work without interruption!" And again he says,—and shall we not unite with him?—"O God! how thy works infinitely surpass the reach of our feeble understandings; all that we actually know of thee, or ever can, is but a faint and lifeless shadow of thy adorable perfections, in contemplation of which the brightest understandings grow bewildered."

CHAPTER VII.

Food of Bees. — Gathering and storing of Pollen and Honey. — Learn from the Bee to shun Evil. — Storing of Honey in the Hive. — The Bees and the Poets.

The food of the bee consists of pollen, or "bee-bread," and honey; or, speaking with greater accuracy, bees in their perfect state feed chiefly on sweet juices, especially the nectar or honey of flowers, while the ordinary food of their young in the larva state is the pollen of flowers, or a paste made from pollen and honey, called "bee-bread."

If you examine a lily, or any other large, simple flower, you will see rising from its center several tall, slender stems, each having its anther thickly covered with a fine dust or meal. Botanists call this *pollen*. The bee gathers it as already described, and carries it home in her curious baskets. As long ago as the time of Aristotle, it was observed that bees collect the whole store of pollen which they convey at one

load from the same kind of flowers; hence some enter the hive with red pellets, others with yellow ones, others with green ones, and some with pellets of a whitish hue. Most diligent are they in this service. In April and May, they collect it from morning to evening; but in the warm months, they gather it from the time of first leaving the hive, sometimes as early as four in the morning, to about ten o'clock. All that enter the hive about that time may be seen with pellets in their baskets; during the rest of the day it is brought in more rarely, unless the swarm is recently established. In a large hive, a pound is sometimes brought in a single day.

The bee laden with pollen, on its return, sometimes stops at the entrance of the hive, and very leisurely detaches its load by piecemeal, and devours one or both the pellets on its legs. At others, she enters the hive and walks upon the combs; always, whether standing or walking, beating with her wings. The noise thus made seems to be a call for help; three or four bees advance, place themselves around the newly arrived, and begin to lighten it of its load, each

taking and devouring a small piece of the produce. If others do not come to their aid, they do this three or four times, till the whole is disposed of. When more pollen is collected than is wanted at once, it is stored up in some of the empty cells. The laden bee puts its two hind legs into the cell, and with the middle pair pushes off the pellets. When this is done, this one, or if too much fatigued another, enters the cell with its head first, and remains there sometime. Its employment is to dilute the pellets, knead them, and pack them close. A large portion of the cells of some combs is filled with this bee-bread. Everywhere it is ready for use.

Flowers lose nothing of their beauty or fragrance from the gleanings of the bee, but, on the contrary, the pollen being shaken down by the bee and borne from blossom to blossom, it is found that her visits contribute to the fertility of the plant.

Pluck a clover-blossom. Pull out one of its long, slender flowers, and suck from the little tube the rich juice. This is honey, sweet, delicious honey; the very article for which we value the bee so highly. It was a common and a valued article of

food in Bible times, and was the emblem of wealth and prosperity. We read of lands "flowing with milk and honey," meaning countries abundant in the good things of life; and the well-known richness and sweetness of honey furnish many of the most foreible illustrations of the Scriptures.

The bee stores up the honey for use in the long, cold winter when the flowers are gone, and the ground is white with snow. How like the prudence of the farmer, who, before the winter months have come, fills his garner with grain and fruit from his fields. Who teaches the bee thus to provide for eoming wants? Even the same kind God that teaches the little ant, "whieh, having no guide, overseer, or ruler, provideth her meat in the summer and gathereth her food in the harvest."

The bee seems readily to distinguish the poisonous from the harmless plants. She carefully avoids the oleander, so injurious to flies, and the white and showy blossom of the crown imperial; while she delights in the clover-blossom, the rose, the fragrant lilae, the sweet-smelling sage, and similar plants, from which is colleeted the most delieate

and highly-flavored honey. She loves, also, the apple-blossom, the flower of the apricot, the peach, the plum, the cherry, and many others. The white clover, however, yields honey in greatest abundance, and the bee will seldom leave this for any other plant.

What a beautiful lesson does the bee teach us in seeking all that is good and shunning evil, and how does the little insect illustrate the Scripture precept, "Enter not into the path of the wicked, and go not in the way of evil men. Avoid it, pass not by it, turn from it and pass away." Shall we not be as wise as the bee? Shall we not say with the Psalmist, "Blessed is the man that walketh not in the counsel of the ungodly, nor sitteth in the seat of the scornful." How, too, should we seek for those true riches of God which are more to be desired than gold, which are "sweeter than honey and the honey-comb." Thus receiving God's teachings and learning his will, we can say with sincerity, "How sweet are thy words unto my taste! yea, sweeter than honey to my mouth."

The bee gathers the honey with the curiously-formed tongue which has already been described.

Alighting on a flower, the cheerful hum of her wings ceases, she unfolds her tongue, which, for safe keeping, had been rolled up under her head, and stretching to her full length laps up the honey with apparent greediness, and fills her bottle with the rich nectar. As we see her drinking the sweet juices of the flower, we should wrong the busy worker if we supposed she was selfish in her labor, and was simply gratifying her "sweet-tooth" with no thought for others. As soon as she reaches her home, like a loyal subject, she offers to the queen a portion of the contents of her bottle, pure as when she drank it from the flowers. Reserving a trifling portion for herself, she goes to one of the cells, where are kept the household supplies, and empties her bottle, and starts again to replenish her store; or, sometimes she finds a group of laborers employed in building or in repairing some portion of the city, hungry, thirsty, and tired with their toil, and gives to them of her abundance.

It should be remembered that honey is not *made* by the bee, as is often supposed, but is *gathered* from the flowers in its pure state.

When the bee is fully laden with pollen and honey, she flies straight as an arrow to her home, and from this fact we have easily learned to call a straight line a "bee line." How is her unerring flight directed? Who is her guide? Some think memory aids her in finding the hive; some that her far-sighted eyes lead her safely; and others that, by some additional sense or instinct, that same paternal Power, whose care is over all, is pleased to conduct to and fro, not alone the bee and the bird, but a variety of other creatures who lack tongues to inquire the way.

To us God gives plain directions for our every-day life, and teaches us to call upon him at all times and make known our wants. "In all thy ways acknowledge him and he shall direct thy paths."

As we think of the bee, gathering through the warm summer days its baskets of food and laying by a store of good things for the future, we can say with the poet,

"Sweet laborer! 'mid the summer's golden hour,
Full oft I trace thy little busy flight;
With pleasure see thee perch from flower to flower,
On violets, woodbines, roses, lilies bright."

Or we are reminded of "Thomson's Seasons," where he sings of the meadow,

"Full of fresh verdure and unnumbered flowers,"

and says,

"Where their delicious task the fervent bees,
In swarming millions, tend; around, athwart,
Through the soft air, the busy nations fly,
Cling to the bud, and with inserted tube,
Suck its pure essence, its ethereal soul;
And oft with bolder wing, they soaring dare
The purple heath, or where the wild thyme grows,
And yellow, load them with the luscious spoil."

In the days of this rural poet, the bee was supposed to "suck" the honey with a tube-like tongue. The reader will remember that this error was corrected a few pages back.

"Thou cheerful bee! come, freely come,
And travel round my woodbine bower;
Delight me with thy wandering hum,
And rouse me from my musing hour.
Oh, try no more you tedious fields;
Come, taste the sweets my garden yields:
The treasure of each blooming mine,
The bud, the blossom, all are thine!

"And careless of the noon-tide heat,
I'll follow as thy ramble guides,

To watch thee pause to chafe thy feet,
And sweep them o'er thy downy sides:
Now in a flower-bell nestling lie,
And all thy busiest ardor ply;
Then o'er the stem, though fair it grow,
With touch rejected, glance and go.

"O Nature kind! O laborer wise,
That roam'st along the summer ray,
Gleau'st every bliss thy life supplies,
And meet'st prepared thy wintry day.
Go, envied, go; with crowded gates
The hive thy rich return awaits:
Bear home thy store in triumph gay,
And shame each idler on thy way!"

CHAPTER VIII.

Eyes of Bees. — Antennæ. — Sense of Touch. — Hearing. — Their Economy of Time. — Queen Elizabeth. — Value of Time. — Former Custom of Destroying Bees. — Modern Hives. — Thomson on Cruelty to Bees. — Ventilation of Hives. — Who taught the Bee — Enemies of the Bee. — Bee Moth. — Fortifications of a Hive. — Gratitude to God for the Volume of Nature.

The eye of the bee is large, and composed of a great number of little six-sided surfaces, or *facets*, thickly set with hairs. In addition to the two eyes common to animals, the bee has three bright spots upon the top of the head, supposed to be eyes, and intended to give an upward vision while she is gathering food from the cups of flowers. As bees fly straight to their hives from long distances, it has been thought that their sense of vision is very acute; yet we often see them blundering about their homes, running their heads against the hives, and at last compelled to find their way in by their feelers.

The feelers, or *antennæ*, are most delicate organs of touch, and, from their flexibility and constant motion, it is probable that through them bees receive most of their impressions. By these they examine, by these they work, by these they talk, and their removal completely changes the instincts of both queen and worker.

The power which they possess of guiding their movements in the dark, as well as in the full light of day, at least in the hive, is usually attributed to the *antennæ*. They are averse to any light in the hive, and carefully close every crevice through which a ray can enter. Although the honey is collected in the bright sunshine, the work in the hive is reserved for the night-time or dark days. How economical of time! and what a lesson to man who wastes so many hours in idleness.

The hours and days of misspent or wasted time will some day be a source of deep regret to us. An ancient king once cried, "I have lost a day!" and Queen Elizabeth, on her dying bed, exclaimed in remorse, "Millions of money for an inch of time." "Improve the present ere the moment flies;" and while we take pattern from the bee in

worldly wisdom, and in the improvement of every hour, let us not forget our spiritual welfare ; that "*now* is the accepted time ; behold, *now* is the day of salvation."

It was once considered necessary to kill all the inhabitants of the hive, or at least to drive the swarm to another hive by smoke, in order to remove the honey and the wax; but the skill of man, and a better acquaintance with the habits of the bee, have rendered these cruel practices needless. Hives are now constructed so that the honey can be removed at pleasure, without injury or disturbance to the insects. The beautiful glass boxes of honey, which can be seen in almost any grocery store, showing so plainly the delicate work of the bees, are taken from the newly-invented hives; and we can enjoy the delicious sweets without the pain of thinking that our pleasure is at the sacrifice of the comfort and perhaps the life of the little toilers which so industriously gathered it.

The poet Thomson, in whose day bees were destroyed for the sake of the honey, grows indignant at the wholesale murder of the insects,

and suggests what man's ingenuity has since devised.

"Ah, see here, robbed and murdered in that pit
Lies the still heaving hive! at evening snatched,
Beneath the cloud of guilt-concealing night,
And fixed o'er sulphur; while not dreaming ill,
The happy people, in their waxen cells,
Sat tending public cases, and planning schemes
Of temperance, for winter poor; rejoiced
To mask, full flowing round, their copious stores.
Sudden the dark, oppressive steam ascends;
And used to milder scents, the tender race,
By thousands, tumble from their honeyed domes,
Convulsed, and agonizing in the dust.
And was it, then, for this you roamed the spring,
Intent from flower to flower? for this you toiled
Ceaseless the burning summer heats away?
For this in autumn searched the blooming waste,
Nor lost one sunny gleam? for this sad fate?
O man! tyrannic lord! how long, how long
Shall prostrate nature groan beneath your rage,
Awaiting renovation? When obliged,
Must you destroy? Of their ambrosial food
Can you not borrow? and in just return
Afford them shelter from the wintry winds!
Or, as the sharp year pinches, with their own
Again regale them on some smiling day?
See where the stony bottom of their town

Looks desolate and wild; with here and there
A helpless number, who the ruined state
Survive, lamenting, weak, cast out to death."

It should be our aim never to cause needless discomfort or pain to any of our fellow-creatures, but through our whole life to carry sunshine and happiness, instead of sorrow and tears.

Bees, wiser than men, ventilate their dwellings with great care. They seem to understand the value of pure air, and their manner of securing it is among the most marvelous achievements of instinct. It seems almost impossible that a hive containing many thousand insects, and communicating with the open air with but one small opening at the bottom, and even that usually obstructed by the throng passing in and out, should contain pure air. But the bees, as easily suffocated as any other insect, are equal to the task, and keep the hive well ventilated. The air is renewed through the door of the hive, where an inward current is produced by the agitation of the wings of the inmates. Some of the workers are always employed in this way, and constantly relieve each other. They station

themselves both inside and outside of the entranee; those outside with their heads toward the door, those within with their heads in the opposite direetion. They then imitate the aetion of flying, and in this way a powerful eurrent of air is produeed, and the hive kept in a pure and healthful state. The humming sound heard in a hive, espeeially on a warm day, is thus explained.

The bee has many enemies, but its most dangerous foe is the *bee-moth*. This inseet does not destroy the bee directly, as do its other enemies, but deposits its eggs in the hive, or in some ereviee leading to it. After the eggs are hatched, the young grubs feed upon the eomb. It is singular that this moth should brave alone the poisonous stings of the bees, but sueh is the ease. On his approaeh, the bees seem paralyzed with fear; they shake their wings, or, in response to the dread sound of the invader, they make a peeuliar buzz of alarm. The moth fearlessly enters and eats of the honey while the frightened bees look on with trembling. But as soon as he has departed, they reeover their eourage, and take

the most active measures to prevent a second intrusion. If the moth should again appear, he would probably find all entrance barred by a strong waxen wall built within the doorway of the hive, with only space enough left for the passage of a single bee.

The perfect desolation of a hive in which these moths have gained a foothold, is truly pitiable. Huber, finding great ravages committed among his bees by this insect, says he made a grating which should admit the bee, but not the moth; and as soon as this was done, the trouble ceased. Strange also to say, the bees of other hives not so defended formed a similar protection; nor were these all alike, but variously constructed in different hives.

"Here," he says, "was a single wall, whose opening arcades were disposed in its higher parts; there were several bulwarks behind each other, like the bastions of our citadels; gateways, masked by walls in front, opened on the face of the second row, while they did not correspond with the apertures of the first. Sometimes a series of interseeting arcades permitted free egress

to the bees, but refused admission to their foes. These fortifications were massy, and their substance firm and compact, being composed of propolis and wax."

One of the most thorough students of bee-life says that he has detected a system of police among the bees; certain individuals being evidently stationed as guards and watchers, who walk their regular "beats," and attend faithfully to all the duties of their office. They are continually upon the look-out for intruders, enemies, and thieves, and when they discover any such prowling about their premises, they give the alarm to the inmates of the hive. A thief bee can be told the moment it is seen. It creeps about, or rather skulks around, in the most suspicious manner, evidently bent upon some mischief, and is carefully watched by the police bees as they guard the walls of the hive.

After considering the curious facts we have related, who will hesitate to say,—

"All things that are, though they have several ways,
Yet in their being join with one advice
To honor God; and so I give thee praise.

> But who hath praise enough ? nay, who hath any?
> None can express thy works but he that knows them."

While then we praise God for the volume of nature, one page of which we have spent a pleasant hour in reading, shall we not bless him still more for that sacred word which reveals to us a Redeemer, without whom "was not any thing made that was made." In him who is the "Light of the world," and "in whom all things consist," should be our trust; to him our prayers and praises should be directed. Let us give thanks to him for the greatness of the blessings he is ready to bestow on all his children, and for the perfect and eternal happiness of a glorious hereafter.

CHAPTER IX.

Other Honey-Bees. — The Humble Bee. — The Carder Bee. The Lapidary Bee. — The Carpenter Bee. — The Mason Bee. — The Mining Bee. — The Upholsterer Bee. — The Poppy Bee. — The Rose-leaf Cutter. — "Tho Works of the Lord are great."

THE reader will not wish us to close this book without speaking of other kinds of bees, which, although not so interesting in their life and habits, perhaps, as the hive bee, nor so useful to man, are yet objects well worthy of our study and notice.

The different species of bees are very numerous, and to describe them all would require a volume much larger than this, and the reader would find it tedious. One traveler speaks of fourteen distinct species of honey-bee generally small in size, and stingless, in one district of Central America. The swarms usually make their homes in the hollow limbs of trees. The people remove these to their houses, suspend them in

the porches, and in this simple way obtain large quantities of wax and honey. The honey is said to be contained in little bags about two inches in length, ranged along the hive in rows, with the cells for the young occupying the center.

The Humble Bee.

Next to the hive bee, which has been described at some length, the most familiar, perhaps, is the humble bee. It makes a loud humming noise in flying; whence we get the name; in Latin, *bombus*, and in English, the *bumble* or *humble bee*.

These live in small families compared with the large communities of hive bees, never numbering more than three hundred, and often not more than sixty or seventy. They all perish in the winter with the exception of a few females which become the founders of a new colony in the spring. These females grow to a very great size, being about six times as large as the workers, and in the early spring-time may be seen prying into every hole and crevice in the ground to find a place suitable for a nest. If they can

find a deserted mouse-hole, they immediately appropriate it to their own use, and fit it up with all the skill of bee architecture. If no such nest ready-made is to be found, they dig one with great industry, and, considering their size, in a very short time. They seem to prefer meadows or plains for their nests, and excavate the ground to a depth of one or perhaps two feet. These houses are large, arched at the top, or dome-shaped, and more wide than high. The materials used are earth and moss, which are most ingeniously worked into the proper shapes and positions, and the interior cells are carefully lined with an inferior kind of wax. The entrance is sometimes a simple opening at the lower part, though perhaps more generally a winding, moss-covered passage-way, built as if to guard against intruders or enemies. The bottom of the nest is carpeted with leaves, which the industrious insects have carried there; and on these are placed irregular masses of brown wax, which in time is made into cells for the young.

The humble bees are of three kinds: the females, which are the largest; the males, which are the

smallest, and the workers, of an intermediate size. The females assist in the work of constructing the cells, and, at the first laying, deposit eggs of both males and females; the latter, on reaching their full growth, are only one sixth the size of their mother, and lay only the eggs of males.

Unlike the hive bee, they appear to have no queen who reigns alone. Several females live peaceably under the same roof, which we have already seen can never be the fact with the hive bee. There is also another difference: the males in the humble bee's nest are as industrious as any of the other members of the household; there are no idlers there, and all unite in working for the common good.

The humble bee is less irritable in his temper than the hive bee, at least he is not so ready to use his stings. It has also sometimes been thought that he has less intelligence, but this is probably a mistake.

The younger Huber gives an interesting illustration of their ingenuity. He once put several humble bees in a glass case with a piece of comb

containing ten cocoons, but so uneven that it tottered and would not stand firmly. The poor bees were greatly troubled at this, as it prevented them from clustering upon the young after their usual custom. At length, as if they had discovered a way to remedy the difficulty, several of them mounted the comb, and fixing their hind legs to its upper edge and their fore legs to the table, succeeded in steadying the mass. They continued in this position three days, by which time they had secreted wax enough to build little pillars to support the comb. An accident displaced these waxen supports, and a second time the patient and ingenious creatures went to work as before. Mr. Huber, taking pity on them, and touched by their evident trouble, then aided them, and they had no more difficulty.

The humble bee is generally seen near the ground, but sometimes he flies to a great height. When General Frémont ascended the highest peak of the Rocky Mountains, where probably no human foot had ever been before, he said, in his report of his expedition, "On the summit, where the stillness was absolutely unbroken by any sound

and the solitude was complete, we thought ourselves beyond the reach of animal life; but while we were sitting on the rock, a solitary humble bee came winging his flight from the eastern valley, and alighted on the knee of one of the men. It was a strange place — the dry-rock, and the highest peak of the Rocky Mountains — for a lover of warm sunshine and flowers; and as pleased as ourselves with the idea that he was the first of his species to cross the mountain barrier, a solitary pioneer to foretell the advance of civilization."

If the reader should open the nest of a humble bee, he would find several combs placed one above another, and supported by small pillars of wax. These combs are not formed of honey-cells, as was the case with the hive bee, but of the cocoons spun by the young before they change into perfect bees.

When the young brood are in the larva, or caterpillar state, they live socially or together, until they are about to change into nymphs, when each spins a silken cocoon, in which it remains, head downwards, for four or five days, and then comes out into a new existence.

On the top of the combs will be noticed a few large cells made of wax, nearly round, or globular in shape. These are constructed by the females, and contain the eggs, larvæ, and a supply of food. Pollen and honey compose the food of the workers, and pure honey that of the males and females. In addition to the supply for the young, they lay up a little store of honey for rainy days. They do not, however, lay by as large an amount as the hive bee, because, as most of them die in the autumn, it is not needed.

What a delicate arrangement of the instinct is here seen. The hive bee seems to know that it must prepare for coming wants, and acting with a considerate forethought, "lays by her store in summer;" the humble bee seems equally well to know that she has but a few weeks to live, and therefore makes no provision for the future.

The little quantities that the humble bee stores away are put up in round, open-mouthed vessels, made by cutting off the ends of the empty cocoons and strengthening them by an outside rim or band, and an inside coating of wax. Sometimes, however, when wax is abundant, they construct

their honey-jars of it, but this is not usually the case.

The honey and wax are of the same origin and nature as in the case of the hive bee.

A nest is occupied but one year; all the ingenious and delicate arrangements perish, and the few females that have survived the frosts of winter must commence a house in some new place and with fresh materials. How wonderful is that instinct which directs them! With no experience to teach them, they build their first and last dwelling with as much accuracy and skill as if they had lived many seasons, and profited by all labors of the past. Though God has given to the bee such powers, how much nobler those which he has conferred upon us, and how great is our obligation to Him who made us in his own image.

The Carder Bee.

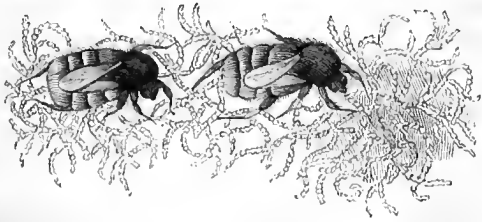
The nest of the carder bee is often found by mowers in the open fields and meadows, and it is sometimes seen in banks, and among moss-grown stones. It is composed of a dome of withered grass or moss, placed over a shallow hole

in the ground, about six inches in diameter. When they can not find a hole suited to their purpose, the bees undertake the mighty task of digging one for themselves. In building their nests, they bring nothing from a distance, but use the material, whatever it may be, that is within their reach. They have no way of transporting their building material except by pushing it along upon the ground, the bee, for that purpose, working backward, with its head turned from the nest.

This process is very interesting, especially when several bees are engaged in it. A solitary bee at work makes slow progress, but she works patiently on until her task is ended. But when the nest is populous, and can afford many laborers, there is a very ingenious division of the work. A file of bees, sometimes six in number, is stationed at equal distances from the nest to the moss or grass which they intend to use, the heads of all the bees being turned from the nest, and toward the material. The most distant bee seizes some of the moss with her jaws, and having *carded* it with her fore legs into a sort of felt, or small bundle, she pushes it under her body to the next bee, who passes it in

the same manner to the next, and so on, until it is brought to the border of the nest and in a position for use. The reader will readily see the reason for the name — *carder* bee.

The following figure represents two carder bees working the moss toward their nest: —

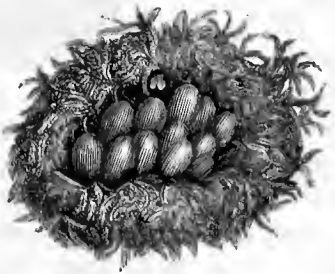


Carder Bees Heckling Moss.

The dome or roof of their houses is sometimes seen rising four, or even six inches above the level of the plain or meadow. In addition to moss and grass, a coarse kind of wax is often used to form the ceiling of the roof, for the purpose of keeping out the rain, and as a protection against high winds. Before the waxen finish is given, it has been noticed that, on a fine, sunshiny day the upper portion of the dome is opened a little, apparently for the purpose of hastening the hatching of the eggs;

but at the approach of night it is closed again. This opening, although most convenient for the bees to use in passing out and in, is never employed for that purpose. They always use the regular entrance, which is a long, curved way opening at the bottom of the nest. This passage way is about a foot long and half an inch wide.

The interior of the carder bee's nest presents but little of that beautiful regularity and symmetry which we have noticed in the bee-hive. We find



Interior of a Carder Bee's Nest.

only a few egg-shaped, dark-colored cells, placed somewhat irregularly, but nearer to a horizontal than a perpendicular position, and connected together by small, shapeless columns of brown wax.

Sometimes we find two or three of these oval cells situated one above another, without any thing to unite them.

These cells are not the workmanship of the old bees, but of the young grubs, who spin them when they are about to change into nymphs. From these silken cases, which they have spun so tightly around themselves, the imprisoned insects have no means of escape, and depend for their release upon the old bees, who gnaw off the covering and set the young bee at liberty. The instinct with which the old bees know the precise time to release the infant is truly wonderful. These cocoons, when thus left by their inmates, are by no means useless, but afterward serve for honey-pots, and are indeed the only store cells of the nest.

The true breeding cells are contained in several irregular masses of brown wax, of different sizes, but of a flattened or globular shape. On opening one of these, a number of eggs or grubs are found, for which the mother bee has collected the masses of wax, which also contain pollen moistened with honey for their food.

In all essential respects, the carder bee in its

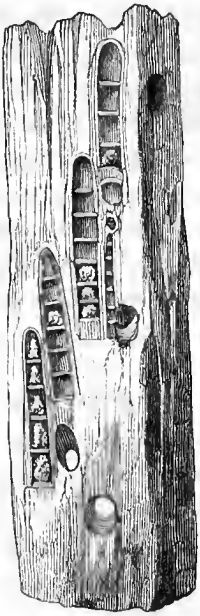
life and habits is similar to the humble bee. Indeed the only apparent difference is in the situation and formation of the nest. There are three sizes, the females being the largest; all labor for the common good, and several females can occupy the same nest in harmony.

The carder bee is not so large as the common humble bee, but rather shorter and thicker than the hive bee. Its color is similar to that of the withered moss or grass with which it builds its nest, — the fore part of the back being a dull orange, and the hinder part marked in rings of different shades of grayish yellow.

Carpenter Bees.

These ingenious little workers are especially partial to posts, fences, and the wood-work of houses which has become soft by the beginning of decay. Wood actually decayed, they reject as unfit for their purposes; but they have no objections to any holes previously made, if they are not too large. Sometimes they take possession of an old nest, repair and refurnish it, and thus easily provide a suitable dwelling.

The labor of digging or cutting out a home in the wood is performed by the female, the



Cells of the Violet Carpenter Bee.

male apparently taking no interest in the matter. This work is of great magnitude, considering the

size and delicacy of the tools employed, but the little carpenter works on until the house is finished.

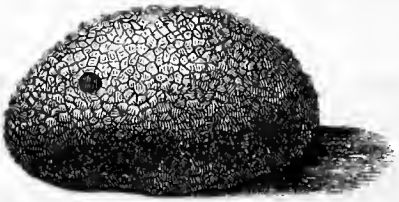
Great skill is shown in excavating the houses. The wood is tunneled, as shown in the opposite figure, and divided into cells a little less than an inch in depth. It is necessary for the proper growth of the young bees that they should be separated from each other, and also be provided with adequate food. The mother knows exactly the amount of food each grub will require during its growth; and therefore she does not hesitate to cut it off from any further supply. In building the cells, the violet carpenter bee uses the sawdust which she has made in gnawing out the gallery, having collected it as fast as made into a little store-heap at a short distance from the nest. Other species use clay for the same purpose.

The carpenter bee deposits but one egg at a time. She covers this nearly an inch in depth with the pollen of flowers made into a paste with honey, and closes in the whole with a tight ceiling, or roof. Upon this, she deposits and packs another egg, and so on. Of course, the lowest

egg is hatched first, and must come out first. To provide for this, the mother makes a little opening at the bottom of each cell, through which the infant may escape.

Mason Bees.

Among the most interesting of insect-architects must be classed the mason bees. Their nest, or more properly their stone house, is a dome-shaped dwelling, built, as one would suppose at first glance, of mud and clay, and looking very much like a rounded mass of dirt thrown against a roadside wall.



Exterior Wall of Mason Bees' Nest.

It is composed of a great number of pellets of clay, kneaded together, and laid one upon another until the nest is completed, a little opening being left for the door. Within are separate cells, or

chambers, of the form and size of a lady's thimble, finely polished, and about the color of plaster-of-Paris.

Cells of Mason Bee. One third natural size.

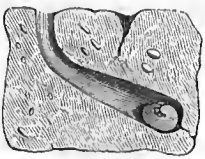
There are different species of mason bees, but they all possess the same general characteristics.

Mining Bees.

There is a very small kind of bees, many of them not larger than a common house-fly, that dig little tubular galleries in the ground.

These passage-ways are but a trifle larger than the body of the bee, and terminate in a thimble-shaped, horizontal chamber, slanting off at right angles to the passage-way, and nearly twice as wide. The whole labor of digging this curious little dwelling, with its long entrance cut out of

the hard clay, is performed by the female, who also provides all the food. The females of the



Cell of Mining Bee.

solitary bees have no assistance in their tasks; the males are idle, and there are no workers to come to their assistance, as among the inmates of the hive.

Sometimes the bees pile up at the entrance the dirt scooped out from the gallery and chambers, and when the grub is hatched, and supplied with a sufficient quantity of food, the earth is used to close up the opening in order to prevent the intrusion of any enemies.

The Upholsterer Bee.

The ingenious manner in which one kind of bee fits up and furnishes her nest, has given it the name of the "upholsterer," or sometimes the "poppy bee," from the material used in her delicate work.

The nest is generally about three inches deep, gradually widening as it descends, and shaped like a bottle. The inside is smooth, uniform, and polished. The bee adorns her house with scarlet drapery. Selecting the scarlet field-poppy, she cuts off small oval pieces, seizes them between her legs, and conveys them to the nest. She first spreads a carpet on the floor, three or four leaves in thickness, and covers the walls with the brilliant curtains never less than two leaves in thickness, and often more. If she has brought a piece of leaf too large for the place, she neatly trims and cuts it down, and spreads the pieces as smoothly as glass. We should find it very difficult to cut a poppy-leaf as smooth with scissors as the bee with its delicate instruments.

After the bee has hung her little chamber with this elegant scarlet tapestry, and has extended the decorations even beyond the entrance, she fills it with the pollen of flowers, mixed with honey to the depth of half an inch. In this store of provisions she lays an egg, and over it folds down the tapestry of poppy leaves from above. The upper part is then filled with earth.

It is an interesting question, What can be the motive of the bee in selecting this showy flower, and adorning its home with the scarlet leaves? Does the brilliant color please her taste? And why should not an insect be pleased with colors? Who knows but that she has a perception of the beautiful and the pleasing?

Some one has spoken of the poppy bee in these lines.

"Royal cradles lined with down,
By plume surmounted, or by crown!
There's a chamber in the earth
With a cradle in that dwelling,
Furnished for a humble birth,
Yet all your workmanship excelling
Far as the lily's arch of gold
Outshone King Solomon's of old.

"Crimson tapestry lines the wall,
Crimson curtains graceful fall
Round the tender nurseling's bed;
And beside it, heaped on high,
Luscious food, from flow'rets shed,
Waits his wants, a rich supply
Say by whom this chamber drest,
Who can be its looked-for guest?

"None but soft maternal care
Such a nursery could prepare;
Yet when the nurseling opes his eye,
Earth alone might seem his mother;
For around, beneath, on high,
Vainly would he seek another:
His is far in fields of air!
While he bursts to being there.

"Perhaps she sips her honeyed pleasure,
Forgetful of her infant treasure;
Yet blame her not, ye lady mothers!
She is but a poppy bee;
Only mind that ye and others
Do your duty well as she, —
When by loving foresight guided,
For her offspring's wants provided."

There is another industrious member of the "upholsterer" craft called the rose-leaf cutter.

Rose-Leaf Cutter.

From June to August there are often to be found on rose-trees leaves from which have been cut pieces of a circular or oval form, with as much

smoothness and regularity as if with a pair of scissors. This is done by the leaf-cutter, who uses the little pieces in fitting up her home. Having made or found a hole in the ground or wood, or a wall, from six to ten inches deep, she builds within it of the leaves several cells, of the shape and about the size of a thimble, the bottom of one fitting into the mouth of the next below it.

Nest of Rose-Leaf Cutter.

It takes about a dozen pieces of leaf to make a single cell, and as each is finished, she stores it

with a rich-colored food made of pollen and honey collected from flowers of the thistle. Upon this the bee lays her egg, and covers in the whole with three more pieces of leaf, cut in a circle as accurate as if marked with compasses. Above this cover there is sufficient room left for the insertion of the next cell; and so the leaf-cutter goes on with her work until her little nursery is completely fitted up.

Can we cease to wonder at the skill and ingenuity of the bee? And do we not see that God's beautiful creation is full of interest to us, — that the more we study it, the more is our admiration excited!

The Lapidary Bee.

Boys who have been on farms, and observed the heaps of stones which have been gathered from the fields, have doubtless seen the lapidary bee; for it is in such stone heaps as these that they love to build their nests. It carries thither bits of moss collected from the field, and constructs a neat little nest of a regular oval shape. The bees all share in the work, and make honey with great industry. If any of the readers of this book

have ever disturbed them in their rocky home, they have found them to be very irritable, and have probably fled from the revengeful creatures in great haste. The author has often, to his sorrow, displaced a stone in some heap in the mowing-field, and, pursued by the excited bees, taken steps for home with greater speed than was consistent with dignity, and not always without receiving very sensible evidence that even then his flight had not been sufficiently rapid.

As we close this little volume, we can sincerely quote the words of the Psalmist, "The works of the Lord are great, sought out of all them that have pleasure therein. His work is honorable and glorious, and his righteousness endureth for ever." Truly he is the God "which doeth great things and unsearchable; marvelous things without number."

THE END.

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